

# User Guide to Standard Plans

## Section ES –TEMPORARY WOOD POLES

<b>Sheet Numbers</b>	ES-18A, ES-18B, ES-18C, ES-18D, ES-18E, ES-19A, ES-19B, ES-19C, ES-19D, and ES-19E
<b>Implementation</b>	This user guide applies to the latest versions of Standard Plan Numbers above.
<b>Project Development Procedures</b>	<ul style="list-style-type: none"> <li>• Check for latest applicable version of Standard Plans(s) from <a href="http://www.dot.ca.gov/des/oe/construction-contract-standards.html">http://www.dot.ca.gov/des/oe/construction-contract-standards.html</a></li> <li>• Get the applicable version of this User Guide from <a href="http://des.onramp.dot.ca.gov/structure-policy-innovation/des-owned-standard-plan-user-guides">http://des.onramp.dot.ca.gov/structure-policy-innovation/des-owned-standard-plan-user-guides</a></li> <li>• Get specifications (see “Contract Specifications” section below).</li> <li>• Verify that the project conforms to Standard Plans, the Users Guide, and the specifications and determine which sheets are needed. <ul style="list-style-type: none"> <li>○ For questions on interpretation of the Standard Plans or the User Guide, contact the Senior Technical Specialist for Signs and Overhead Structures.</li> <li>○ For questions on the interpretation of the specifications contact Structure Specification Research and Development Branch.</li> <li>○ For detailed assistance in verification, fill out a special designs work request form.</li> </ul> </li> </ul> <p>If elements of the project do not conform, then the fill out a special designs form to request a custom design. In some cases custom design is only needed for a certain portion.</p>
<b>Description of Component</b>	Use for new construction of temporary structural supports for electrical and traffic operations systems such as overhead conductors (including electrical conductors and data conductors), and traffic signals. These structural supports use round timber poles, messenger wires, guy wires, guy wire anchors, tether wires, and related hardware. Use inside or outside of Special Wind Regions. Use inside or outside of Ice Load Region.

# User Guide to Standard Plans

## Section ES –TEMPORARY WOOD POLES

<b>Description of Component (continued)</b>	<p>Certain situations are covered by other standards or would not usually utilize these Standard Plans.</p> <ul style="list-style-type: none"> <li>• Permanent structures.</li> <li>• Structures which support only the overhead electrical supply equipment of public utilities (whether publically owned or privately owned). For these, the structural design is regulated by California Public Utilities Commission (CPUC) for privately owned public utilities or by locally elected officials (as provided for by state law) for publicly owned public utilities.</li> <li>• Lightly loaded poles covered by 56-3.06, “Wood Poles” of the 2015 Standard Specification. For instance poles used for typical electrical service drops or poles that only support a single 6’ luminaire mast arm.</li> <li>• Non-highway structures such as a wood pole to support a maintenance radio antenna at a remote mountain top.</li> </ul>
<b>Standard Drawing Features</b>	<p>ES-18A</p> <ul style="list-style-type: none"> <li>• General notes</li> <li>• Structural data for overhead conductors</li> <li>• Determination of <math>d_p</math></li> <li>• Overall maximum weight of overhead bundle</li> <li>• Maximum allowed vertical span</li> <li>• Sag requirements</li> <li>• Pole foundation</li> </ul> <p>ES-18B</p> <ul style="list-style-type: none"> <li>• <b>Non-guyed pole</b> not carrying overhead bundles</li> <li>• <b>Non-guyed poles</b> carrying overhead bundles (<b>no signal faces/signs</b> on the overhead bundles)</li> <li>• Pole selection table</li> <li>• Horizontal span restrictions</li> </ul> <p>ES-18C</p> <ul style="list-style-type: none"> <li>• <b>Guyed poles</b> carrying overhead bundles (<b>no signal faces/ signs</b> on the overhead bundles)</li> <li>• Pole selection table</li> <li>• Horizontal span restrictions</li> </ul>

# User Guide to Standard Plans

## Section ES –TEMPORARY WOOD POLES

<b>Standard Drawing Features (continued)</b>	<p>ES-18D</p> <ul style="list-style-type: none"> <li>• <b>Guyed poles</b> carrying overhead bundles (<b>with signal faces/signs</b> on the overhead bundles)</li> <li>• Pole selection table</li> <li>• Horizontal span restrictions</li> </ul> <p>ES-18E</p> <ul style="list-style-type: none"> <li>• <b>Non-guyed poles</b> carrying overhead bundles (<b>with signal faces/signs</b> on the overhead bundles)</li> <li>• Pole selection table</li> <li>• Horizontal span restrictions</li> </ul> <p>ES-19A</p> <ul style="list-style-type: none"> <li>• Messenger wire, guy wire, and tether wire connection details</li> </ul> <p>ES-19B</p> <ul style="list-style-type: none"> <li>• Guy wire anchorage details</li> </ul> <p>ES-19C</p> <ul style="list-style-type: none"> <li>• Luminaire arm details</li> </ul> <p>ES-19D</p> <ul style="list-style-type: none"> <li>• Terminal compartment attachment details (such as used when attaching a signal to a pole)</li> </ul> <p>ES-19E</p> <ul style="list-style-type: none"> <li>• Details for attaching overhead signals and signs to messenger wires and tether wires.</li> </ul>
<b>Other Aids</b>	<p>See Attachment A:</p> <ul style="list-style-type: none"> <li>• Worksheet for determination of <math>d_p</math>. This method is the same as that used on sheet ES-18A. The purpose of the worksheet is to assist the Engineer in determining if the Standard Plans are able to provide a buildable solution. The equation used on this worksheet provides an approximation of <math>d_p</math>. For situations involving only a few conductors, it might be unconservative, however, the requirement to round up to the next listed increment of <math>d'</math> resolves this issue since the lowest value of <math>d_p</math> listed is 1". In cases involving a very large number of conductors, the approximation of <math>d_p</math> may be overly conservative.</li> </ul>
<b>Design/General Notes</b>	<p>Structural Design Notes:</p> <ul style="list-style-type: none"> <li>• Design: AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Fifth Edition (LTS-5).</li> <li>• GROUP LOAD COMBINATIONS: <ul style="list-style-type: none"> <li>○ I Dead Load</li> <li>○ II Dead Load + Wind Load</li> <li>○ III Dead Load + 0.5 (Wind Load) + Ice Load</li> <li>○ IV Fatigue: Not used</li> </ul> </li> </ul>

# User Guide to Standard Plans

## Section ES –TEMPORARY WOOD POLES

<p><b>Design/General Notes</b> (continued)</p>	<ul style="list-style-type: none"> <li>• <b>LOADING:</b> <ul style="list-style-type: none"> <li>○ Wind Loading: 100 mph (3-second gust and 50 year recurrence interval)</li> <li>○ Wind Recurrence Interval (for adjusting down the wind 50 year wind pressure): 10 years</li> <li>○ Combined height, exposure, and elevated terrain factor = 1.05 (Exposure C, structure is not located on or over the top half of a ridge, hill, or escarpment more than 33' taller than the surrounding terrain)</li> <li>○ Ice Loading: 3.0 psf on surfaces, 0.60 in radial thickness of ice at a unit weight of 60 pcf on bundles</li> </ul> </li> <li>• <b>BASIC DESIGN VALUES:</b> <ul style="list-style-type: none"> <li>○ Round Timber Poles: <ul style="list-style-type: none"> <li>▪ <math>F_b = 1850 \text{ psi}</math></li> <li>▪ <math>F_v = 110 \text{ psi}</math></li> <li>▪ <math>F_{cp} = 230 \text{ psi}</math></li> <li>▪ <math>F_c = 950 \text{ psi}</math></li> <li>▪ <math>E = 1500 \times 10^3 \text{ psi}</math></li> </ul> </li> <li>○ Design Wire breaking strength: <ul style="list-style-type: none"> <li>▪ ASTM A475, Utilities Grade, 7 strand, modified by termination efficiency factor of 0.8</li> </ul> </li> </ul> </li> <li>• <b>FOUNDATION DESIGN NOTES:</b> <ul style="list-style-type: none"> <li>○ Maximum slope around pole base 1V:2H</li> <li>○ Pole embedment depth design is based on Broms' approximate procedure as described in Article 13.6 of AASHTO LTS-5.</li> <li>○ Embedment depth is calculated based on following soil parameters, <ul style="list-style-type: none"> <li>▪ Cohesive Soil: <ul style="list-style-type: none"> <li>• Shear strength of soil <math>c = 1500 \text{ psf}</math>.</li> </ul> </li> <li>▪ Cohesion less Soil: <ul style="list-style-type: none"> <li>• <math>\phi = 30 \text{ deg}</math>, <math>\gamma = 120 \text{ pcf}</math>.</li> </ul> </li> <li>▪ Soil assumed to be unsaturated.</li> </ul> </li> <li>○ An overload factor of 2.0 and an undercapacity factor of 0.7 were used for safety factor of 2.86. <ul style="list-style-type: none"> <li>▪ Allowable vertical bearing pressure at the end bearing of poles is 3000 psf at 6 feet or more embedment.</li> </ul> </li> </ul> </li> </ul>
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<b>Drawings Needed for PS&amp;E</b>	<p>Project specific plans</p> <ul style="list-style-type: none"> <li>• Show pole locations, supported items, and other information sufficient to supplement the needed Standard Plans for a bidable and constructable set.</li> <li>• Do not require supported items that are not included in the Standard Plans except through appropriate structural design/check or approval.</li> </ul> <p>Standard Plans</p> <p>Isolated round timber pole having attachments to the pole (no mast arms)</p> <ul style="list-style-type: none"> <li>• Use sheets ES-18A and ES-18B</li> <li>• Add sheet ES-19D if terminal compartment mounted to pole is needed (such as would be used to mount a signal to a pole).</li> <li>• See sheet ES-18B for configuration limitations such as attachment limitations.</li> </ul> <p>Round timber poles supporting overhead bundles.</p> <ul style="list-style-type: none"> <li>• Use sheets ES-18A and ES-19A</li> <li>• Add sheet ES-18B or ES-18C (with ES-19B) or both <ul style="list-style-type: none"> <li>○ Add sheet ES-18B if a non-guyed version is needed.</li> <li>○ Add sheets ES-18C and ES-19B if a guyed version is needed.</li> </ul> </li> <li>• Add sheet ES-19C if a luminaire mast arm is needed.</li> <li>• Add sheet ES-19D if terminal compartment mounted to pole is needed.</li> <li>• See sheet ES-18B and/or ES-18C for primary configuration limitations, such as horizontal span limits and attachment limitations.</li> <li>• See sheet ES-18A for limitations on vertical span limits.</li> </ul> <p>Round timber poles supporting overhead bundles plus tether wires, traffic signals, and small sign panels.</p> <ul style="list-style-type: none"> <li>• Use sheets ES-18A, ES-19A, and ES-19E</li> <li>• Add sheets ES-18D or ES-18E (with ES-19B) or both <ul style="list-style-type: none"> <li>○ Add sheets ES-18D and ES-19B if a guyed version is needed</li> <li>○ Add sheet ES-18E if a non-guyed dead-end version is needed.</li> </ul> </li> <li>• Add sheet ES-18E-3 if a luminaire mast arm is needed.</li> <li>• Add sheet ES-18E-4 if terminal compartment mounted to pole is needed.</li> <li>• See sheet ES-18C and/or ES-18D for primary configuration limitations, such as horizontal span limits and attachment limitations.</li> <li>• See sheet ES-18A for limitations on vertical span limits.</li> </ul>
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<b>Contract Specifications</b>	Specifications for temporary wood poles is in Section 48-6 of the 2015 Standard Specifications (via Revised Standard Specifications).
<b>Restrictions on Use of Standard Drawings</b>	<p>Special Design is needed for:</p> <ul style="list-style-type: none"> <li>• Cases where the structure is located on or over the top half of a ridge, hill, or escarpment more than 33’ taller than the surrounding terrain.</li> <li>• Cases where the slope near the pole base is greater than 1V:2H.</li> <li>• Cases outside of the limitations shown on the relevant sheets. Some important issues to consider are               <ul style="list-style-type: none"> <li>○ Horizontal and vertical spans allowed</li> <li>○ Sag allowed</li> <li>○ Maximum <math>d_p</math> and weight allowed for overhead bundles</li> <li>○ Weight or diameters of overhead conductors on sheet ES-18A.</li> <li>○ Messenger wire attachment heights allowed</li> <li>○ Clearances needed</li> <li>○ Attachments that are larger or heavier than allowed</li> <li>○ Attachments needed in locations not allowed</li> <li>○ Additional attachments needed</li> <li>○ Problems with required guy wire locations</li> <li>○ Poor soil conditions</li> <li>○ Water table</li> <li>○ Ground profiles</li> <li>○ Conflicts with existing structures</li> <li>○ Conflicts with existing overhead or underground utilities</li> </ul> </li> </ul>